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32.0 CONSTRUCTION

32.1 INTRODUCTION

The construction of the Alaskan segment of the Alaska Natural Gas Transportation System (ANGTS) covers a large geographical area that includes extreme terrain, weather, and ecological conditions that create special logistical and management needs. The key to quality construction that meets all objectives and requirements of the project stipulations and design criteria, as well as applicable regulations and work standards, is the organization that enables execution and pre-planning for critical construction elements such as quality assurance and quality control. This section of the Technical Information Supplement details key provisions of the project construction planning in these regards.

32.2 CODES AND CRITERIA

32.2.1 Codes

- Code of Federal Regulations, Title 18 – Conservation of Power and Water Resources
- Code of Federal Regulations, Title 49, Transportation, Part 191, Transportation of Natural and Other Gas by Pipeline; Annual Reports, Incident Reports, and Safety-Related Condition Reports
- Code of Federal Regulations, Title 49, Transportation, Part 192, Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards
- Federal Right-of-Way Grant for the Alaska Natural Gas Transportation System Alaska Segment, Serial No. F-24538 (December 1, 1980), as such may be updated and/or amended from time to time
- Federal Energy Regulatory Commission conditional certificate of public convenience and necessity, issued on December 16, 1977, as such is finalized

32.3 SCOPE OF DOCUMENT

This section of the Technical Information Supplement will define Construction requirements and planning for the following areas of the project:

- Construction Management – Section 32.4
- Alaskan Personnel Procedures – Section 32.5
- Technical Support– Section 32.6
- Pipeline Construction– Section 32.7
- Compressor and Metering Stations– Section 32.8
- Temporary Facilities– Section 32.9
- Special Design Areas and Procedures– Section 32.10

- Transportation Services – Section 32.11

Within each of these areas, this section discusses the requirements and expectations of the construction activities to be performed. More detailed procedures and instructions will be prepared prior to commencement of the specific task and/or work activity.

32.4 CONSTRUCTION MANAGEMENT

Construction will be managed in Alaska by a Facilities Engineering and Construction Management Contractor and a Pipeline Engineering and Construction Management Contractor (ECs) reporting to the Senior Engineering and Construction Manager within the Alaskan Northwest Natural Gas Transportation Company (ANNGTC) Project Management Team (PMT). The Alaskan Northwest Natural Gas Transportation Company has overall responsibility for management of the project. The Engineering and Construction Management Contractors will manage the various pipeline and station Construction Contractors (CCs).
Construction will be assigned to the pipeline CCs on a spread and geographic basis. ANNGTC will procure most permanent facility materials to ensure the quality and consistency of components. This will also assist in facilitating on-time deliveries for installation. The Senior Technical Services Manager will be accountable for procurement and logistics for the project. The CCs must meet specified contractual performance obligations and they will be closely monitored throughout construction. These obligations include:

- Adherence to designs, configurations, and specifications
- Prepare and implement quality programs in accordance with ANNGTC's requirements
- Assisting in ANNGTC's quality inspection and surveillance activities
- Adherence to environmental safeguards established by ANNGTC, as well as federal and state stipulations
- Adherence to safety and health standards as determined by ANNGTC, as well as derived from applicable labor agreements and federal and state agencies
- Adherence to employment standards as listed in applicable labor agreements and laws
- Adherence to the ANNGTC's socio-economic plan.

The ECs will monitor the CC's activities on behalf of ANNGTC to ensure these obligations are met.
In addition to execution contracts, certain work will be awarded to Project Service Contractors (PSCs). These PSCs will provide the services and/or supplies necessary to support the construction operations where project-wide service and/or supplies are advantageous. An example PSC might be project wide construction camp security services or catering. The PSCs will be managed by the Senior Engineering and Construction Manager's staff.

32.4.1 Technical Support

ECs will provide technical support for field staff during the construction and commissioning phases of the project. The support staff will be made up of personnel in the fields of welding,

engineering, controlled blasting, erosion control, revegetation, geotechnical, field survey, and other construction disciplines.
Managing environmental issues will be one of the prime objectives of the PMT. With the PMT, a Senior Environmental Manager will be accountable for all environmental matters. The Senior Environmental Manager will be assisted in this by and Environmental Management Contractor who will provide assistance in the execution of environmental programs, studies and information gathering (archaeological, biological, aquatics, soils, and traditional knowledge) and provide information and expertise to support and assist in the completion of, design and construction planning, preparation of regulatory submissions and inspection of construction activity
Major permit packages will be prepared by the PMT, who will compile drawings and specifications prepared by ECs and the Environmental Management Contractor into permit packages. Submission of the permit packages to the proper agencies will be coordinated with ANNGTC's Senior Regulatory Manager. Notices to proceed will be issued to the CCs through the PMT.

32.4.2 Quality Management

A Manager of Quality Systems will accountable for monitoring the project quality and documentation programs. For additional information on Quality Management, see Section 35, Quality Management.

32.4.3 Planning and Controls Management

The PMT headquarters will have a small staff under the direction of the Senior Technical Services Manager to provide project-wide planning capability, including cost control and construction progress. Detailed project planning and control will be delegated to ECs who will provide project control information to the PMT as directed by ANNGTC.

32.5 ALASKAN PERSONNEL PROCEDURES

32.5.1 Affirmative Action

An Affirmative Action Plan, pertaining to Equal Employment Opportunity (EEO) and maximum practicable utilization of Minority Business Enterprises (MBE) and Female Business Enterprises (FBE), will be developed.

32.5.2 Environmental and Safety Orientations

The PMT will establish guidelines necessary to meet the requirements of state, federal, and local agencies. Personnel working on the ANGTS will be required to attend an environmental and safety orientation to understand these requirements. Objectives of the environmental and safety orientations are to provide project personnel with:

- An understanding of the Alaskan environment.
- An understanding of the environmental effects of irresponsible actions.

- An understanding of state and federal environmental laws and penalties associated with the project.
- An understanding of ANNGTC's policy of minimizing adverse environmental effects associated with construction of the project and the conformance to all applicable environmental laws and regulations.
- The safety orientation will incorporate information for constructing the ANGTS while working in an arctic environment. It will be the CCs responsibility to provide environmental and safety orientations for their employees.

32.5.3 Safety

32.5.3.1 Policy

It is the objective of the project safety program to ensure that every employee working on the project is provided with safe and healthy work environment. It is the policy of the ANNGTC to comply with the project safety procedures as well as provisions of the Occupational Safety and Health Act and other federal, state, and applicable local safety codes. The safety program objectives are to:

- Implement a program that will enable construction of the project with minimum risk to health, life, and property with particular consideration given to problems inherent in the scope, complexity, and location of the construction activities.
- Provide to the contractors and their subcontractors all safety program requirements to ensure that safe practices are performed in a consistent manner and to ensure uniform administration, inspection, and reporting of the safety program.
- Implement construction safety policy that emphasizes the benefits of training for sustaining effective construction safety for the duration of the project
- Ensure that federal and Alaskan safety, health, and fire protection regulations are observed by all contractors involved in the Alaska Segment.

32.5.3.2 Project Safety Plan

The Health and Safety Manager, within the PMT will establish health and safety policy and requirements for the project and will be responsible for liaison with governmental agencies related to the health and safety program. CCs will be responsible for developing and implementing health and safety programs within the scope of their respective construction and support responsibilities. Such programs will include:

- Establishing safety meeting requirements.
- Meeting program requirements.
- Staffing to meet organizational needs.
- Controlling the safety program through orientations, training, inspection, reporting, and conducting safety meetings (tool box and tailgate type).

- Providing liaison and coordination with ANNGTC on a regular basis.
- Providing safety coordination to others (e.g., to governmental agencies, regulatory bodies, news media, and agencies) as directed by ANNGTC.
- Implementing plans and programs for fire protection, medical, and other health services and for mitigating hazards while working in a harsh environment.

Review and approval of contractor health and safety programs will be the responsibility of the PMT. Each CC will be contractually responsible to meet, as a minimum, the health and safety program requirements of ANNGTC and will exercise coordination and control over the safety programs and activities of its subcontractors.

All employees must be orientated on safety policies and procedures at the jobsite. It is the CC's responsibility to see that the following information in the safety orientations is communicated:

- Specific Job Rules
  At the time of hire, every employee will receive a copy of the job and safety rules booklet developed for that specific contract.

- Camp Rules and Regulations
  At the time of hire, every employee who will be housed in a camp will receive a project handbook covering general rules and regulations while living in a project construction camp.

- Violation of Rules and Dismissal
  Every employee will be informed that violation of jobsite and camp safety rules or safe practices may be cause for dismissal.

- Jobsite Safety Program
  Safety and camp orientations will be outlined for every employee by a qualified safety representative

- Report of All Injuries
  Every employee will be instructed to report hazards, injuries, accidents, and near misses to their company safety representative and to consult with a first aid attendant for all injuries, no matter how slight they may appear.

- Items for Personal Protection
  Every employee will be issued a hard hat and informed that other items for personal protection will be issued as required. All employees will wear safety equipment and clothing appropriate to work and climatic conditions.

- Work Hazards
  When an employee is first assigned to a crew, the supervisor or foreman will explain the work assignment and inform the employee of any hazards specific to their job description.

- Health and Safety in a Harsh and Remote Environment

Part of each employee's orientation will include personal protection in an arctic environment. This will include camp and cold weather safety practices. All employees will receive a copy of the American Petroleum Institute's handbook, "Staying Alive in the Arctic."

32.5.4 Fire Protection Program

Fire can cause injury and loss of life, damage to property; and can lead to costly delays. The primary objectives of the Fire Protection Program are to:

- Prevent fires
- Eliminate or reduce the potential loss due to fire
- Provide early fire detection
- Keep fires from spreading
- Extinguish fires promptly
- Care for and/or evacuate the injured
- Re-establish routine operations

The Fire Protection Program will include the following elements.

32.5.4.1 Fire Control Plans

The PMT will develop safety guidelines. Because each jobsite is unique, each CC will establish an approved fire control program that suits its particular situation. The program must meet the objectives of the general project-wide fire control procedures and include a survey of existing campsites to identify potential fire hazards. Ongoing training for a site-by-site fire brigade is required. Items that are highly susceptible to fire must be removed or segregated.

32.5.4.2 Fire Protection Equipment

Adequate fire protection equipment must be provided at each camp and jobsite. The equipment will be available during camp construction. All fire hazards must be identified by type so that appropriate fire fighting equipment can be placed nearby. Frequent inspection of this equipment is required to ensure that it is in good working condition. Combustibles must be properly stored with consideration give to their location. Regular surveillance of all fire hazards must be carried out.

32.5.4.3 Coordination of Fire Control Plans with Other Entities

In case of fire, it is essential that all CCs understand the procedures to be followed when combating the fire or evacuating personnel. Fire control efforts must be coordinated and must not be impeded by other operations. Individual CC efforts must conform to all project procedures established for project-wide application.

32.5.4.4 Fire Control Procedures and Equipment Locations

All personnel on project jobsites will be advised of fire-fighting procedures and the location of fire-fighting equipment. As changes are made to either the plan or the fire-fighting equipment location, personnel will be notified. Continual on-the-job orientation and training is required to ensure that these procedures are built into job responsibilities and routines.

32.5.4.5 Updating the Fire Control Plan

As the work progresses and is completed, the Fire Control Plan will be modified to meet changing conditions. Notification of changes to the Fire Control Plan will be communicated to all employees. Safety personnel will be assigned the responsibility of keeping procedures and notifications up to date.

32.5.4.6 Orderly Evacuation Plan

In the event of a major fire, personnel not involved in combating the fire will be evacuated in an orderly manner. Evacuation procedures will be posted at conspicuous locations at the campsites. The fire evacuation plan is to be discussed in detail at safety meetings to ensure that it is understood by all.

32.5.4.7 Project Fire Protection Program

To prepare contingency plans for controlling and promptly extinguishing a fire, the PMT ECs and CCs will review each site for overall fire prevention and containment planning. This planning will include a review of fire fighting; the identification of fire-fighting access routes; plans for effective utilization of available personnel and fire brigades; and emergency evacuation plans designed to deal with unusual fire-fighting problems. Coordination of activities between authorities, supervisors, and fire brigades at jobsites and campsites is a mandatory requirement of effective fire prevention and control.

32.5.5 Security/Law Enforcement

32.5.5.1 Policy

The PMT is responsible for monitoring the security program for compliance, violations, and incidents that could disrupt the continuity of the project, and render assistance as required. Coordination is required among the CCs, the PMT, APSC, and public law enforcement agencies to ensure that prompt assistance is available at all times.

32.5.5.2 Security / Law Enforcement Plan

Each CC will provide and control security on its site. EC security personnel will administer this activity. PMT will assist in planning and coordinating total project security and liaise with law enforcement agencies

Security guards must be qualified, properly trained, and indoctrinated in security services. Each work site will have security supervision capable of acting on security matters independently (within project guidelines) for activities affecting that site.
Security guard duties will vary with camp and site requirements.

32.5.6 Medical and First Aid

32.5.6.1 Policy

The project medical and first aid program, to be administered by the CCs, will provide medical and first aid facilities and services to employees in the event of injury or illness. The program will ensure that:

- Medical facilities and personnel are available for all employees when required
- The jobsites have first aid facilities, registered nurses, medical technicians, or first aid attendants as required
- Immediate medical evacuation is available
- All record keeping is in compliance with project, federal, state, and insurance requirements

32.6 TECHNICAL SUPPORT

32.6.1 General

Technical support staff will be made up of the various engineering disciplines required to support construction. These disciplines will provide technical expertise in surveying, geotechnical engineering, design (civil/mechanical/ electrical/controls), blasting, welding, pressure testing, revegetation, and environmental engineering.

32.6.2 Field Engineering – Surveying and Technical Data

Pipeline land survey control will be taken from existing USGS, Alaska state, and APSC survey monuments. These monuments are located on mountain tops for line-of-sight surveys, offset points set in concrete, and points permanently cast in structures that are located adjacent to or in the vicinity of the APSC pipeline. Other controls or monuments are located along the existing APSC and Haines ROWs. Supplementary data, including aerial ortho-photography, will also be used to establish survey control. ECs, using contracted surveyors will be responsible for initial construction surveys to define pipeline route and provide reference markers. As-built surveyors will provide as-built drawings as required.

32.6.3 Engineering Support of Construction

The technical support staff is responsible for developing specifications for construction activities that are in compliance with the design criteria. Critical construction specifications include:

- Pipeline Welding - See Section 19, Pipeline Welding

- Controlled Blasting – See Section 32.7.2.4
- Hydrostatic Testing - See Section 29, Pressure Testing
- Geotechnical - See Section 21, Geotechnical/Geothermal
- Revegetation - See Section 12, Construction Rehabilitation
- Environmental Considerations

The extensive planning of the project, including environmental studies, information gathering, and the development of mitigative construction procedures, will minimize impacts on the environment. Project-wide environmental policies and procedures ensure that construction practices are compatible with the Alaskan environment.
Environmental considerations include the disturbance of soils, vegetation, fish, and wildlife, due to construction activities. It is essential to deal with these considerations through proper planning to minimize environmental disturbances.
Environmental inspections, and audits will monitor and control the environmental quality of the work on the pipeline and compressor stations.

32.7 PIPELINE CONSTRUCTION

32.7.1 General

The Alaska Segment of ANGTS will require construction of approximately 745 miles of pipeline From Prudhoe Bay to Delta Junction (approximately 548 miles), the pipeline will generally be constructed adjacent to or on the TAPS ROW, adjacent to the haul road, or on or near the Golden Valley Electrical Association ROW. From Delta Junction to the Canadian border (approximately 195 miles), the pipeline will be constructed adjacent to the Haines Pipeline ROW.

32.7.2 Construction Methods

32.7.2.1 General

Conventional equipment and procedures will be used for construction to the extent possible. Exceptions may be in site-specific basis where insulated pipe is required or where unique ditching requirements must be met. Otherwise, standard construction procedures will be followed using conventional equipment with minimum deviation from traditional and proven methods of laying a pipeline.

32.7.2.2 Clearing, Grading, and Work Pad Construction

See Section 10, Clearing, of this Technical Information Supplement.
Drainage ditches and small streams will be bridged or forded to ensure that construction does not interfere with natural water flow or aquatic life. Temporary and permanent drainage structures will be constructed to maintain the ROW in a well-drained condition.

32.7.2.3 Ditching

See Section 9, Ditch Configuration, of this Technical Information Supplement.
Conventional ditching, using large excavators and wheel trenchers will be used for excavation where possible. Permafrost/frozen soils and rock conditions will necessitate the use of rippers, chain type trenchers, and/or explosives. Mitigative measures, requiring extra depth excavation, may be utilized in areas of frost heave susceptibility.

32.7.2.4 Blasting

Controlled blasting will be required to break up and fracture frozen soils or rocks to enable site and trench excavation by construction equipment. Procedures specified by federal and state regulations will be closely followed. Blasting procedures and safety standards developed through preconstruction test programs will also be enforced.
The ECs' technical support engineers will develop project-wide blasting safety policies and procedures. Technical support personnel will be responsible for monitoring compliance of safety blasting procedures and their application by the ECs or their subcontractors.
Specific distances for shock control and specific matting procedures will be developed by the technical support engineers to enhance blasting safety. The CCs will be responsible for requisitioning, transporting, storing, and using explosives in accordance with state and federal regulations.

32.7.2.5 Hauling and Stringing Pipe

Mainline pipe will be double-jointed to approximately 80-foot lengths, hauled, and placed in intermediate pipe storage sites prior to construction. Stringing trucks will haul pipe via highways, roads, access roads and along the pipeline ROW where it will be offloaded and placed on wooden skids. Turn-arounds for stringing trucks will be constructed at appropriate locations when required.
Pipe will be handled by cranes, forklifts, or side booms in a manner that prevents damage to the pipe walls, ends, coating, and insulation.

32.7.2.6 Bending

Cold bending in the field will allow changes in direction or gradient of the pipe. Bends are made at or near the bend location with a standard hydraulic field-bending machine.
When insulated pipe is required, the bending will probably be performed using the same type of bending machine. The insulation will undoubtedly suffer damage in the bend area but, at the present time, it appears the net result will not materially affect the overall insulation requirements. This matter will be further investigated to establish final design and detailed procedures.

32.7.2.7 Welds

See Section 19, Pipeline Welding, of this Technical Information Supplement

32.7.2.8 Coating

See Section 30, Corrosion Control, of this Technical Information Supplement. Girth welds will be coated manually in the field. After the field welds are completed and accepted, the weld zone will be sandblasted and the appropriate field coating applied. Sufficient cure time is required prior to the lowering-in process.
As part of the lowering-in process, the pipe coating will be checked (jeeped) with a high voltage detector for holidays (spots where the pipe metal are exposed to the atmosphere). These holidays will be repaired according to the repair procedure.

32.7.2.9 Lowering In

The ditch will be free of rocks and any other material that may damage the pipe and/or coating. Where necessary in rocky and permafrost areas, the bottom of the ditch will be bedded with select materials for protection of the pipe coating. Pipe cradles, belts, and lifting devices suitable for handling 48-inch pipe will be used to ensure that no damage is caused to the pipe coating or insulation.

32.7.2.10 Weighting the Pipe

Whenever possible, wet ditches will be dewatered ahead of lowering in. However, in areas of continuous water flow (stream crossings, subsurface springs, summer flood plains, summer marshes [wetlands]) it will be necessary to weight the pipe to keep it on the bottom of the ditch. Various kinds of weighting may be used including continuous concrete coating, prefabricated set-on saddle weights, screw anchors, grouted anchors and pipe sacks, filled with local aggregate.

32.7.2.11 Tie-Ins

Tie-in welds will be made to sections of the pipeline or fittings at river crossings, mainline valves, road crossings, pipeline crossings, and after the pipeline has been pressure tested. Mechanized welding procedures for tie-ins will be investigated to determine applicability on 48-inch pipe.
Pipe end bevels will be prepared using end-prep milling machines, grinding, or filing. External line-up clamps will be used to align the pipe ends for welding and the pipe ends will be preheated according to the weld procedures. Once the weld is completed, radiographic or ultrasonic inspection of the weld will be made, and the weld zone will be coated prior to backfill.

32.7.2.12 Backfilling, Bedding, and Padding

Backfilling is the process of covering the pipe with excavated material and filling the ditch to grade, after it is lowered into the ditch. The excavated material is placed back in the ditch over the pipe, using excavators, dozers and padding machines. Bedding will be placed in the ditch bottom where rock or permafrost could damage the pipe and/or coating. The bedding material will be relatively low water content and of a gradation to ensure no damage to the coating. It may be obtained from the excavated material, from the work side of the ROW, or hauled in from borrow areas.

Padding material, from borrow pits will be placed around the pipe in areas of rock, boulders or blasted permafrost. Padding machines may process rocky excavated material and use it as backfill. The remaining excavated material shall be used as backfill, restoration or vegetation. Unacceptable material may be disposed of at approved disposal sites. A roach (mound or crown) of the backfill material will be left along the ditch line to compensate for settlement. Drainage courses will be built into the roach to allow for natural surface drainage. Subsequent maintenance will repair subsidence, washouts, excessive erosion, etc.

32.7.2.13 Pressure Testing

The pipeline will be pressure tested after backfilling to ensure the integrity of the pipeline. The testing will generally be performed by filling the pipe with water, increasing the pressure to the specified limit, holding at this limit for the designated period, relieving the pressure, and then displacing the water. Alternative techniques for testing, such as by air, will require site specific determination.
See Section 29 for more information on Pressure Testing.

32.7.2.14 Cleanup and Restoration

See Section 12, Construction Rehabilitation, of this Technical Information Supplement.
Cleanup, erosion control, and revegetation work will be applied to all areas disturbed during construction. This includes construction ROW, access roads, material sites, temporary storage areas, disposal sites, campsites, and airfields.
Temporary structures and debris will be removed. Large rock fragments will be used for riprap material or will be blended into the surrounding terrain. Materials not suitable for restoration and revegetation will be disposed of in approved sites. All waterways will be cleared of obstructions placed during construction that are not a part of the finished work and restored to ensure normal flow and to ensure that there is no interference with fish migrations and/or normal drainage patterns.
Drainage control devices, such as culverts, bridges, and ditches will be constructed during pipeline installation in accordance with project designs and specifications. All erosion control methods and measures will be conducted in a manner to minimize disturbances to thermal equilibrium and minimize permafrost degradation and causes of sedimentation.
Seeding of the final grade of the construction ROW, material sites, and disposal sites will be done with conventional aerial, mechanical, or hydro-seeding methods.
Cleanup for winter work will be done the following winter.

32.8 COMPRESSOR AND METER STATIONS

32.8.1 General

The Compression and Facilities ECs will prepare the construction specifications and drawings for the compressor and meter stations. All compressor stations will be similar in layout and design. Building trade CCs will construct the compressor and meter stations. Those CCs will have total responsibility for construction utilizing craft employees hired from the appropriate unions. A plan and construction schedule will be developed for each compressor and meter station.

32.8.2 Prefabrication and Pre-assembly

Permanent facility equipment and materials will be prefabricated to the maximum practical extent to reduce installation man-hours. Mechanical and electrical equipment will be shop skid-mounted or modularized for quick installation directly onto the foundations. Structural steel and process piping will be shop fabricated for transportation by truck, and it will be marked for proper location and sequence of installation. Roofs, siding, and floor panels will be prefabricated with insulation, and field connections for efficient handling and quick erection.
Removable siding and roof panels will be designed into the building structures to facilitate installation of compressors and turbines.

32.8.3 Site Preparation

Site preparation will proceed in a sequential manner to meet construction schedules for compressor and meter stations.

32.8.3.1 Survey and Control

Horizontal and vertical controls will be established using existing government and APSC monuments in the compressor station area.
Additional monuments will be located at intermediate points along the property lines as necessary to fully set out and delineate the site limits.

32.8.3.2 Clearing and Grading

See Section 10, Clearing, of this Technical Information Supplement.
The compressor stations will be constructed on gravel pads to prevent degradation of the permafrost. Final earthwork consists of finish grading for tanks and buildings and excavating trenches as required for piping and utilities. Where possible, material will be stockpiled for use later in construction, restoration, and revegetation. If material is designated as unsuitable for these uses, the spoil will be moved to an approved disposal site.

32.8.3.3 Material and Disposal Site Selection

See Section 5, Material Sites, and Section 6, Disposal Sites, of this Technical Information Supplement.

32.8.3.4 Construction Access Roads

See Section 7, Access Roads, of this Technical Information Supplement.

32.8.3.5 Blasting

Blasting for site work and trench excavation may occur at compressor stations situated on bedrock. All blasting techniques will be based on engineering and agency requirements and comply with state and federal regulations. Plans for storage and use of explosives will be submitted for agency approval.

32.8.3.6 Drainage Control

See Section 11, Drainage and Erosion Control, of this Technical Information Supplement. During the construction phase, drainage will be provided by surface drainage ditches, culverts, and by properly shaping stockpiled material.

32.8.3.7 Fencing

Permanent boundary fencing will be erected following site preparation of the facility.

32.8.3.8 Station Equipment Installation

32.8.3.9 Refrigeration Equipment

The discharge temperature of the gas at each compressor station will be controlled by gas chillers connected to a mechanical refrigeration system. The temperature of the refrigerant will be automatically controlled by circulation through mechanical refrigeration chillers.

32.8.3.10 Miscellaneous Equipment

Fabricated equipment packages that will be erected on steel pile or concrete foundations will include such items as gas scrubbers, air-cooled condensers, launchers, and receivers, power generators, miscellaneous pumps, vessels, tanks, motor control centers, switchgear, fire protection equipment, flow meters, and communication facilities. This equipment will be erected or installed by craft personnel utilizing conventional erection methods.

32.8.3.11 Buildings

Each compressor station will consist of buildings to house all major equipment and components such as the compressors and turbine drivers, refrigeration units, and gas scrubbers. These buildings will also house aboveground meter runs, instrumentation, communications equipment, control and calibration equipment, and the life support utility systems.

32.8.4 Station Piping

32.8.4.1 Pipe Welding and Installation

The bulk of the compressor station piping will be shop fabricated and shipped by barge, rail, and/or truck to the field sites. Shop fabricated pipe will have flanged and/or random lengths for field connections. Flanged or beveled ends will be cleaned and checked for line-up tolerances prior to welding or bolting. Piping materials will be transported and erected in manner to avoid damage to pipe walls, flanged ends, valves, and other fittings. Pipe supports, guides, shoes, and anchors will be used to support components during final weld and flange-up. This will ensure no vertical or horizontal movement during final connection that could stress equipment casings.

32.8.4.2 Nondestructive Examination (NDE)

Welding and installation of pipe at compressor stations will be in accordance with applicable project specifications, as well as shop and field welding procedures based on applicable codes and standards. NDE inspection using radiographs and/or ultra sonic examination of all welds will be processed and read onsite for immediate determination of weld acceptability.
All piping test procedures and specified supporting documentation will meet project-wide quality compliance standards.

32.8.4.3 Pressure Testing

Station piping will generally be field tested with water being the primary test medium. Testing procedures and pressures will be in conformance with project testing specifications and applicable codes.

32.8.5 Electrical Components and Testing

All electrical components installed at compressor stations will be in accordance with applicable electrical codes and project design specifications. Installation of motor control centers, switchgear, motors, lights, grounding, and solid state components will be by conventional means. Sensitive materials and equipment will be properly protected from cold weather exposure. Following the installation of circuitry networks, wires, cables, and terminals, meggering activities will performed until all wiring associated with power generation, controls, switchgear, motor control centers, and transformers has been thoroughly checked. All electrical tests and subsequent supporting documentation will meet quality compliance/quality assurance standards and procedures. Inspections will be made of motor rotations, and relay testing and setting, as well as multiconductor tests, oil breakdown, point-to-point circuit wiring, polarity, resistance, grounding, voltage, and current readings at contacts. Final loop checks will ensure that final wiring numbers correspond with schedules and color-coding.

32.8.6 Control Systems (Instrumentation)

Each compressor station will include a complete control system that will monitor and control station functions. Control of compressors, gas turbines, and electrical power generators will be by dedicated control systems. Installation of the compressor station control system equipment and materials will be similar to the methods of installing other electrical components.

32.8.6.1 Field Testing and Calibration

The field testing and calibration of the compressor station control system will generally verify manufacturer performance specifications, establish baseline operation records, and ensure that the instruments will measure, control, and record within the manufacturer’s tolerances. Field testing and calibration of instruments, such as relief valves, will be performed on special test stands within a selected instrument shop.

32.8.6.2 Process Checkout

All piping, instrument, and control systems will be checked out to verify that they have been installed as designed.
Checkout also includes stroking control valves with controller/transmitter devices, checking positioners and actuating alarms, as well as checking interlock operations that are tied in with the other compressor station supervisory control systems. Final checkout will include functional or simulated checks of interrelated station control systems, fire and explosion monitoring systems, emergency shutdown systems, Operational Control Center (OCC) communications, and special purpose turbine and compressor operational systems.

32.8.7 Cathodic Protection

To provide corrosion protection within the compressor station, a cathodic protection system will be applied in the field in accordance with the applicable codes, corrosion control design, and methods.

32.8.8 Meter Station Construction

Access roads to the meter station will be provided by civil crews. Fencing at the meter stations will be installed after the site work has been completed. Equipment to be installed at the meter station will include flow meters, dew point monitors, hydrogen sulfide monitors, utility equipment, pressure relief systems, and other equipment which may include a gas chromatograph/ Generally, all of the meter station components will be assembled in shops as skid-mounted and pretested units. Insulation and painting will be shop applied and touched up following installation.
Buildings will be temporarily heated for final mechanical completion activities and testing until the project start-up.

32.9 TEMPORARY FACILITIES

32.9.1 Construction Camps

Custom modular facilities required to accommodate and feed the workforce, as well as office, warehouse and shop facilities, will be a factory-built equipped modules that can be transported via highway for assembly into various sized building complexes and configurations. The buildings will be ready for use following erection utility hookup and are capable of withstanding severe weather conditions. All buildings will be designed to meet all applicable building codes.

32.9.2 Camp Design

Camps will vary according to manpower requirements, local terrain features, construction scheduling, and logistics. Generally, the camps will be laid out and contain most of the facilities described below.

- Living quarters
- Kitchen and mess hall

- Recreation complex
- Staff offices
- Security and fire protection system and related facilities
- Utility building for Life-support systems (water, power, communications, etc.)
- Warehouse building
- Construction equipment repair building
- Fuel distribution and containment area
- Wastewater (effluent) disposal area
- Equipment laydown areas
- Heliport

Camp life-support systems will include enclosures and equipment to generate power; extract, treat, and distribute potable and fire water; collect, treat, and dispose of waste water; collect, treat, and dispose of solid waste; provide heat and ventilation; store and distribute fuel; and provide fire protection capabilities.

32.9.3 Camp Operation and Maintenance

Camp management and catering will provide food, housekeeping, commissary, mail, communications, and other personnel support services normally available at remote construction camp locations. Minimum standards for catering and camp management services will be set through project-wide specifications that meet applicable federal and state regulations.

32.9.4 Camp Housing and Support Facilities

32.9.4.1 Recreation Centers

Each recreational facility will include phones, reading/meeting rooms, games television/movies, and exercise facilities. Commissary and post office accommodations will also be available.

32.9.4.2 Medical and First Aid

Medical and first aid facilities in the camp will be clearly marked. The facility will contain living quarters for the medical technicians, a washroom and toilet, a private examination room, and a reception and service area with appropriate emergency medical equipment. Equipment will include refrigeration facilities for storage of perishable medicines, heating elements for sterilization, lockable storage spaces for medical supplies, and bathtub facilities.
Each camp will have a fully equipped ambulance staffed by trained medical personnel. The ambulance will be housed in a heated enclosure.

32.9.4.3 Fire Protection

The fire protection system for each campsite will include the following:

- Each room in the living quarters will contain smoke detection sensors that will initiate audible alarms when activated. The sensors will be connected to a central alarm panel in each of the security offices.
- Mechanical rooms and kitchens will have automatic fire extinguishing systems fitted above all furnaces and cooking areas**.** Generator and firewater facilities will contain a fire extinguishing system as well.
- Fire protection stations will be located in central areas of each dormitory and contain both watering hose racks and dry powder fire extinguishers.
- All-purpose, dry powder and chemical extinguishers will be located throughout the camp complex in the living quarters, kitchen, dining hall, recreation area, security building, offices, and laundry area. They will be strategically mounted in walkways, hallways, and other critical locations. Fire extinguishers will be placed in all radio rooms, power generation plants, and utility areas. All-purpose fire extinguishers, each fitted on a wheeled carriage, will be located near the fuel tanks in an enclosed, marked, and dedicated shed.
- Camp fire protection standards will meet or exceed all legislated requirements.

32.9.4.4 Camp Communications

Communications facilities will be available at all major pipeline and compressor station camps. A mobile UHF/VHF radio system, or equivalent, will be provided to support each construction section. CCs will be responsible for supply, installation, and maintenance of its mobile (vehicle and handheld) units.

32.9.4.5 Security

Fences will be provided for security and wildlife control at each pipeline camp and compressor station construction site. The temporary fences will utilize wire mesh and steel posts at pipeline camps. Permanent fencing will be provided at compressor stations after site grading is complete. On-site security personnel will enforce camp rules and ensure safety and security measures are met.

32.9.4.6 Support Buildings

The offices, shops, warehouses, security buildings, power generation, and utility buildings will be assembled from prefabricated metal buildings or similar.

32.9.4.7 Equipment Maintenance

The CC will provide appropriately located maintenance facilities for their equipment and vehicles. Equipment and containers will be provided to store and remove waste oil from the site. Spare parts for maintenance of construction equipment will be warehoused at each camp site.

32.9.4.8 Material Laydown Area

Temporary construction laydown areas at the pipeline camps will be designed for the least possible damage to the environment. Drainage controls will be constructed to minimize erosion and will be restored to their original condition as soon as feasible. An equipment laydown area at the compressor stations will also be provided. The size of the area will be determined by the amount of equipment and materials scheduled to be stored at the site. Security fencing constructed to enclose areas that will be used to lay out or store permanent facility equipment. Powder magazines meeting all applicable safety and security requirements will be provided in storage locations. Storage locations for explosives will be a safe distance from camp buildings and working areas as specified by agency regulations.

32.9.4.9 Heliports

Where required, there will be heliport facilities at camps. The helipad will typically be a 75-foot square gravel rectangle with off-helipad parking areas defined. Heliport locations will be sited so that approach and departure routes will be over open areas. Electrical plug-ins for helicopter engine and transmission heating during cold weather operations may be provided at the camps.

32.9.5 Utility Systems

32.9.5.1 Potable Water Supply Treatment and Distribution

Water supply and distribution systems will be located at the construction camps. Facilities for pumping, treating, storing, and distributing water will be provided. Potable water quality will be checked routinely according to Alaska drinking water standards.
Treating plants will be sized accordingly and standardized when possible and located in heated buildings. Raw water will be treated and then pumped into water storage tanks. Any water tanks located outside of utility buildings will be heated and insulated for the arctic and subarctic climates.
Where possible, all water pipes will be installed inside heated buildings, hallways utilidors. Other lines will be run in utilidors and will be heat traced and insulated. Outside of the camp boundary limits, water lines will be heat traced, insulated, and routed on temporary supports above grade.
Pump house enclosures used to protect potable water supply equipment (pumps, motors, controls, etc.) will be constructed at each camp.
Water will be used to complement all-purpose dry chemical powder fire extinguishing systems in camps. Emergency firewater storage and pumping equipment will be provided at each camp. The extent of these facilities will depend on the camp size.
Water use plans will be prepared for each camp. Water conservation practices will be put into effect. The plan will also identify alternate water sources and appropriation accessing methods.

32.9.5.2 Fire Water System

Depending on the size and peak loading conditions of the construction camps, emergency firewater pumps will be provided to supplement other fire-fighting equipment. The fire water pumps will be tied into the camp water system to boost pressure and volume. The supply for the

fire water system will be from the raw and potable water storage tanks. Emergency firewater pumps will be housed with the camp utility equipment at the larger pipeline camps.

32.9.5.3 Solid Waste Collection and Disposal

Camp refuse will be collected, stored, treated, and disposed of according to applicable state and federal codes and standards. Detailed waste management procedures for handling sludge, waste, oil, and hazardous substance collection, treatment, and disposal will be developed on a project-wide basis.

All camps will have incineration systems for burning combustible camp and construction refuse. The incinerators will be capable of handling normal daily trash and kitchen waste. Inert incinerator ash will ultimately be disposed of at regional landfills. Incinerators will meet federal and state regulations and standards.

The large pipeline camps may have rubbish containers that can be loaded on trucks and dumped at a designated waste disposal area. The incinerators will be designed to be loaded by a ram type feeder system or manually loaded from front-end loaders or from flatbed trucks. Scrap metal and other salvageable materials will be collected for recycle when practical. Otherwise, scrap metal and nonburnable waste materials will be disposed of at regional landfills permitted for that purpose. Other methods of solid waste disposal, such as landfill agreements with local waste producers, will also be considered.

32.9.5.4 Waste Water Collection, Treatment, and Disposal

Domestic sewage resulting from camp operations will be collected, treated, and properly disposed of such that the effluent that meets the applicable state and federal regulations or codes. Wastewater treatment systems at the large pipeline camps will be designed to accommodate the maximum camp population. Adequate wastewater storage will be provided to equalize flow to the treatment facility, with surge volume protection to absorb the morning and end-of-day peak flows. Low flow capacity features will also be incorporated in the design to handle winter periods when a minimal number of people will be residing in pipeline camps. All camps will use a gravity collection system for sewage, where practical. Use of lift stations (force mains) will be minimized.

32.9.5.5 Power Generation and Distribution

Independent power generation will be provided at locations where commercial power is not available. Diesel-driven or turbine-driven generators will provide continuous electric power at a rate designed to meet each camp's peak electrical demand.

32.9.5.6 Fuel Storage, Distribution, and Dispensing

Each camp will have a tank farm for bulk storage of oil, gasoline, diesel fuel, and lubricants. All of these storage facilities will have low-pressure, quick-discharge, metered pumps. Tanks, bladders, and pumps will be located away from buildings. Tank farm basins will be lined and surrounded by dikes. Field-erected (prefabricated) steel and/or reinforced, impervious bladder tanks are under consideration for use at all camp sites. All camp fuel containment areas and systems will comply with the applicable state codes.

All tanks will be marked to identify contents and pumps will be grounded. All fuel systems will be metered for volume, inventory control, and use monitoring. In-line filters and heaters may be required to reduce paraffin buildup in the winter months. Camp fuel will be run in utilidors or aboveground in welded steel pipe with flex connections placed at strategic locations. Buried fuel lines will not be used to preclude undetected leaks.
Oil spill contingency plans will be prepared for all camps. Oil spill contingency materials and communications procedures for each camp will facilitate containment and cleanup

32.9.5.7 Access Roads

Much of the planned right-of-way (ROW) uses or is adjacent to existing workpads and roads. Existing access locations and facilities will be used to the maximum extent possible. New access roads will only be considered when existing access is inadequate or travel distances become excessive.
Plans for new access roads will be prepared and submitted to permit construction. The plan will show the existing and proposed profile, existing topography affected by the road, the required clearing, a typical road section, drainage features, and any other related information that may be requested.

32.9.6 Intermediate Pipe Storage Yards

Intermediate storage yards will be constructed along the pipeline route to store pipe and other materials in close proximity to the points of installation. Fencing and security requirements will be determined based on types of materials to be stored.

32.9.6.1 Site Selection and Materials to be Stored

Locations of intermediate pipe storage yards will be selected based on the overall construction plan, site availability, and proximity to the ANNGTC ROW. Previous storage sites will be used whenever possible if highway access and the vicinity of ROW access roads are suitable.

32.9.6.2 Preparation

Storage yards will be sized to handle the required quantities of pipe and other materials that must be stored at the site. Each site will be cleared and graded, drainage controls established, and the site capped with a suitable topping of gravel where needed. Where practical, topsoil stripped from the site will be saved to aid future revegetation of the area after the site is no longer needed to support pipeline construction operations.

32.9.6.3 Pipe Storage

Pipe will be stored in a manner that will not be detrimental to the pipe, pipe coating, or pipe insulation. Pipe will be stored in compliance with design specifications for storage and handling.

32.9.7 Borrow and Disposal Sites

Generally, the pipeline and compressor station camps with associated temporary facilities will use borrow and disposal sites located in the vicinity of each camp. Wherever possible, temporary

facilities requirements will be met by using existing or planned borrow and disposal sites. Environmental protection stipulations and measures will be applied.

32.9.8 Pipe Yard

Pipe from the mills will be received at a pipe yard. A stockpile will be accumulated to support processing operations such as double-jointing, cleaning, interior and exterior coating, (depending on the source) and insulation prior to shipment to the intermediate pipe storage yards. A layout design of the pipe yard will be prepared that considers and complements the requirements of the various pipe processing activities.

32.9.8.1 Site Selection and Preparation

The pipe yard site will be selected on the basis of availability of the required acreage and port/rail/highway access. The site will be cleared, graded, and topped with a. firm gravel surface. Adequate drainage will be provided. Detailed design for the facility will include pipe storage locations, layouts for pipe processing activities, utilities, offices, covered storage where necessary, open storage, receiving and dispatch areas, and transportation corridors.

32.9.8.2 Pipe Handling and Storage

Storage and handling will be in a manner that will not structurally damage the pipe. Pipe will be stored on wooden timbers with sizes and spacing to safely support the loads. Safety clamps and wooden chocks will be used as part of the stacking plan.

32.9.8.3 Double-Jointing, Coating, and Insulating Pipe

Double jointing of pipe may be performed at a designated pipe yard. Pipe in 40-foot nominal lengths will be welded into 80-foot double joints for transport to the intermediate pipe storage yards. Pipe coatings may be applied at the pipe mill or at the pipe yard. Insulation will probably be applied at an intermediate (third party) insulation vendor located near the pipe yard.

32.10 SPECIAL DESIGN AREAS AND PROCEDURES

32.10.1 Road Crossings

Major and minor road crossings will be installed by the “slick-bore” or open cut method, without using casings. In the slick-bore method the pipe is carried through the borehole with the auger in the same way that the casing is installed. Open cut installations will be done in the same manner as the open cut cased crossings. The open cut method may require a by-pass road to maintain traffic during construction. Road crossing pipe is a heavy-walled pipe.

32.10.2 Stream and River Crossings

See Section 16, River, Stream, and Wetlands Crossings, of this Technical Information Supplement. The data presented below is an outline of construction methods that may be used. There are three basic methods of crossing a river or stream, each of which is expected to be used.

- The most common method is by excavating a trench across the stream or river bed, pulling and/or carrying the pipe into position, and then backfilling. Excavation can be accomplished by using conventional excavation equipment working off the bed of the stream or river, sleds, ice bridges, or floating barges. Some river and/or streambeds may require drilling and blasting, which will be controlled and monitored.
- Some of the major rivers may be crossed with a bridge to carry the pipe. The construction of any bridge will follow standard procedures for the design and specification of each specific structure.
- The third method is a directional drilling process where there is no disruption to the banks or bed of the river or to any traffic on the river. Considerable technology development work will be required to determine the feasibility and suitability of this technique for the project. With this method a drilling rig on an inclined plane is set up on one bank and a pilot hole is drilled under the riverbed and to the surface on the other bank. The pilot hole is enlarged 8 to 12 inches bigger than the pipe. The reamed hole is swabbed and the welded, coated, and pretested pipe section is then pulled back across the stream or river to the rig side. The pipe is well below the riverbed where it is secure from scour and river traffic. This method keeps all equipment well back from the wetted perimeters. In the event that the HDD installation method fails, conventional open cutting and installation will be considered.

Banks will be restored and erosion control structures will be constructed as soon as practical after completion of the crossing.

32.10.3 Foreign Pipeline Crossings

The majority of foreign pipeline crossings will be where the gas line crosses the Alyeska Pipeline Service Corporation (APSC) pipeline and the associated fuel line. At crossings where the pipeline is buried, the gas line crossing will be designed on a site-specific basis. To safeguard the integrity of the foreign pipeline, it will be daylighted before any installation of the proposed gas line commences. A gravel berm will be installed over the foreign pipeline within the crossing limits. Surface cladding of rock, timbers, or equivalent material will be placed where required to provide the necessary surface protection. Support for the foreign line will be provided as required.

Prior to commencement of work at foreign pipeline crossings, the appropriate approvals must be obtained. The foreign pipeline company inspectors is expected be present during the work.

If the APSC pipeline is aboveground where it is to be crossed, standard pipeline construction techniques will be used. If the boring technique is not used, hand excavation of the ditch immediately below the pipeline may be carried out, as an added precaution.

32.10.4 Valve Installations

Isolation block valves will be installed along the line at approximately 20-mile intervals. These valves will be installed by tie-in crews when they reach the valve location. If the ground conditions mandate short periods of open ditch, it will be excavated by the tie-in crew at the time of installation. The locations and quantities of remotely operated valves are to be determined. Mainline valves are discussed in detail in Section 22, Mainline Valves.

32.10.5 Controlled Blasting

Controlled blasting techniques will be developed and used in all blasting locations where close proximity to existing facilities is a factor. Controlled blasting will be required to break up and fracture high-density frozen soils or rock for excavation by large backhoe excavators. Generally, production blasting will not be permitted near the APSC facilities. Specific site deviations may be permitted with approval from APSC and the state or federal agencies. Methods will be developed and tested during the preconstruction field programs to allow for closer blasting in site-specific instances. Where the APSC facilities are aboveground and fly rock is a factor, blasting mats or other barriers will be used for control.
Controlled blasting techniques will be detailed fully in the technical specifications.

32.10.6 Insulation

Some of the pipe will be delivered to the CCs with insulation applied. The insulation will be jacketed with an impervious coating. A cut back of the insulation at the ends of each joint of pipe will be provided for girth welding, coating, and insulation application in the field. This will be done either by forming with sheet metal and pouring liquid polyurethane, by applying blocks of precast insulation around the pipe in the weld zone, or by spraying a liquid (foam) polyurethane compound. With any of these methods, a water impervious jacket will be placed over the insulation and sealed. A “shrink sleeve” (a sleeve made of a radiation cross-linked polyolefin that shrinks when heated) tape or sheets of the jacket material that are clamped and sealed to the preinstalled jacket are used.

32.10.6.1 Protective Barrier

A protective safety barrier will be developed to protect the elevated sections of the APSC pipeline during the construction period. When in close proximity to the oil pipeline, the gas line will generally be routed on the downhill side and on the far side of a widened workpad. Protective barriers will be constructed to prevent pipe laying equipment and ROW traffic from accidentally crossing the safety zone.
Techniques to ensure oil pipeline protection will be applied through the use of various temporary protective devices, following further consultation with APSC.

32.10.6.2 Pipeline Construction in Wetland Areas

Wetlands in Alaska are usually defined as areas that are predominantly surface saturated with water in the summer months. These areas are sometimes referred to as swamps, marshes, bogs, and muskegs. Pipeline activities in wetlands will generally be limited to winter and shoulder months. Frost penetration should be adequate to provide firm support for heavy equipment to accomplish work more expeditiously.
Cases where subsurface water is a continual problem or the schedule will not allow construction in frozen soils during the moderate months may require ditching and weighting, as described in the aforementioned sections.

32.10.7 Borrow and Disposal Sites

Borrow excavation is required for construction of access roads, temporary material storage yards, pipeline workpad, pipeline bedding and padding, protective barriers, and aggregates for concrete. Disposal sites may be needed for permanent disposal of excess soil and rock, soil with high moisture or ice content, vegetative debris, and other materials removed during the construction of the pipeline.

Selection of borrow material sites will be a part of the preconstruction field programs. Quantities available will be verified and detailed mining plans will be prepared. The clearing areas within each borrow and disposal site and access road will be surveyed and flagged prior to the beginning of the development operations.

Borrow material excavation will be done by heavy construction equipment such as dozers, rippers, loaders, draglines, scrapers, or backhoes depending upon the conditions at the site. Many selected sites were previously used on the APSC project and most easily extractable materials have been removed. Therefore a drilling and shooting operation may be necessary.

Material processing will involve screening the pit run material to remove the coarse fraction when used for pipeline bedding and padding. In some cases crushing of the oversize materials will be required in order to obtain sufficient acceptable quantities. Screening, washing, and crushing operations will also be performed to produce concrete aggregate materials.

Upon completion of borrow operations the sites and access roads not needed for maintenance of the pipeline will be closed. All areas disturbed by the construction activity will be rehabilitated in accordance with approved erosion control and revegetation programs.

Disposal sites will be filled over and graded to cover the unused materials. The erosion control and revegetation treatment applied to disposal sites and access roads will meet the same rehabilitation requirements as borrow sites.

32.10.8 Signs and Markers

Aerial milepost markers and warning signs at roads, trails, streams, rivers, etc. will be installed as soon as practical and as required during the construction phase. They will be constructed and installed to withstand vandalism as much as possible. For further information see Section 25, Pipeline Appurtenances.

32.10.9 Cathodic Protection

Cathodic protection is discussed in detail in Section 30, Corrosion Control.

In thawed ground the main method of cathodic protection applied to the pipeline will be an impressed current system using anode beds and rectifiers.

In some cases, primarily at river crossings, a sacrificial anodic cable will be installed in the ditch immediately prior to backfill. The cable will be electrically connected to the pipe at specified intervals and the connection coated to isolate it from the ground.

At designed intervals test leads will be installed to allow measurement of the electrical potential of pipe with respect to ground. Test leads will also be installed at all foreign pipeline crossings and cased crossing so the potential between the two pipes and the pipe and casing can be measured.

If required, generating sets and current beds will be installed, operated, and maintained by the CCs to provide the impressed current requirements during construction.

Cathodic protection in permafrost areas will be designed on a site-specific basis as needed.

32.11 TRANSPORTATION SERVICES

32.11.1 Logistics Overview

Logistics support will be a vital element in construction of the Alaska segment of the ANGTS. The existence of an Alaskan logistics infrastructure is a major asset to this project. Included in the improved infrastructure are the Prudhoe Bay haul road and improved air and highway carrier capabilities.

Approximately 750 miles of mainline pipe plus petroleum products will account for the majority of the total project material tonnage. Other items, such as compressor and metering station packages, consumable items, construction equipment, and miscellaneous materials will constitute the remainder.

The project logistics plan incorporates use of facilities at several locations in Alaska for intermodal material transfer, customs clearance, and in-transit storage. Intermediate pipe storage yards and material storage facilities along the ROW and pipeline and compressor station camps will serve as delivery sites and laydown storage areas.

The plan is structured for coordinating, monitoring, or controlling the movements of project materials from the source of manufacture to the jobsite. Specific responsibilities will be assigned for the following:

- Purchase, arrange for, and control the movement of all engineered materials from the point of manufacture to the designated material laydown sites in the field. Engineered materials include commodities such as mainline pipe, compressor and metering station materials, station equipment, and valves.
- Purchase and control the transportation of construction equipment, consumables such as petroleum and explosives, cement, rebar, food, and equipment spares. Intra-spread equipment moves and aggregate hauls performed by CCs during actual construction are not addressed in this plan.

All materials delivered to Alaska for this project will use, to the maximum extent practicable, the most overall cost-effective, conventional modes of transportation:

- Through container/trailer marine transport via Anchorage
- Through roll-on/roll-off rail transport via Whittier
- Bulk vessel/barge to Anchorage, Seward, or Valdez
- Direct truck via the Alaska Highway
- Air freight

Within Alaska, truck transportation will predominate. The Alaska Railroad will be given priority for shipments from Seward and Anchorage to Fairbanks.

32.11.1.1 Mainline Pipe Movements

Volume movement of mainline pipe will involve marine, rail, and highway carriers transporting from domestic or foreign mills to intermediate pipe storage yards in Alaska. A number of pipe handlings will be required at the pipe yard facility, at intermodal transfer points, ports, and terminals. Economic transport/handling strategy for the total system movement of line pipe will be paramount.

Domestic pipe movement from North American mills offers a number of modal options for transport to Alaska. These include bulk barge, rail/bulk barge, and rail/rail barge. Total movement economics vary with handling requirements according to the mode selected. Foreign pipe delivery will be by ocean vessel or barge.

Mainline pipe from domestic mills may be routed to a Pacific Northwest port for rail/barge transportation over the Port of Whittier to Fairbanks for storage and movement to intermediate pipe storage yards.

Mainline pipe from foreign mills may be shipped by ocean carrier to the port of Seward. The pipe will then be transported to the pipe yard via the Alaska Railroad for storage, double jointing, coating, insulating as required, and movement to the intermediate pipe storage yards.

Pipe may also be shipped to Valdez and transported by truck to the intermediate storage yards.

For pipe required north of the Brooks Range, consideration will be given to barging the material into Prudhoe Bay. Traffic congestion and freight cost economies will govern the use of this alternative.

Flexibility in the plan is essential to meet unforeseen contingencies such as late deliveries, strikes, or other problems.

Eighty-foot joints of pipe will be transported from the double-joint yard to intermediate pipe storage sites by common carrier or contract trucks pulling self-steering pipe trailers. Over-length pipe movements will be controlled to meet the restriction requirements of the state of Alaska. It is anticipated that over-length permits will be granted for hauling. Positive control of pipe haul traffic will be maintained in coordination with the appropriate state.

32.11.1.2 Petroleum, Oil, and Lubricant (POL) Movements

Project construction operations will be dependent on adequate quantities of POL products. Supply levels of the product must be maintained, daily deliveries scheduled, and workable contingency operations implemented to handle any shortages that may arise.

POL consumption on the project will generate high volume bulk transportation/distribution demands. There will be a continuous requirement throughout the course of the project for a multitude of POL products for construction equipment, camp heating and power generation, vehicle and aircraft operation, and other equipment and facilities. Limited availability of common-carrier highway tankers in Alaska is anticipated. Rail tank cars and possibly marine tankers may also be in short supply. There will be advanced coordination with Alaskan suppliers and carriers to ensure that supplemental equipment is available to support the project. POL movements will conform to governmental regulations relating to handling, transport, and storage.

32.11.1.3 Equipment Movements

The mobilization and positioning of equipment, including repositioning during construction and retrograde movement during demobilization, will be major logistics movements. CCs are

expected to supply and transport their own equipment. If necessary, they will draw upon the same commercial transport capacity utilized to support this project, all other projects, and normal public transportation. The equipment movement will include a wide variety of heavy equipment (side boom tractors, dozers, cranes, backhoes) and light-vehicles (pickups, buses).

32.11.1.4 Specialized Movements

The movement of machinery for compressor stations will require special planning to ensure compatibility of potential oversized or overweight loads with transport capability. Careful consideration will be given to the heavy hauling and unconventional handling that may he required to place either individual or modular turbo-compression and refrigeration machinery packages at station sites on schedule.

32.11.1.5 Hazardous Material Movements

Federal and state regulations governing the transport, handling, storage, disposal, cleanup, and control of hazardous materials are complex and rigorously enforced. Individuals and entities having responsibility for these functions must be thoroughly familiar with the regulations and their application.

The overall project responsibility for compliance rests with ANNGTC through the PMT. Appropriate action will be taken to minimize impact on public health or welfare from accidents and inadvertent discharge of hazardous substances. Safety practice requirements and environmental training for contractor material handling and shipping personnel will be a subject of indoctrination throughout construction.

Contracts will define responsibilities for training shipping personnel that specify compliance with applicable federal and state laws or regulations. Liability exposure for noncompliance will also be covered in all contracts.

Compliance with hazardous material regulations will remain with the supplier or shipper until transfer of accountability of the material is made to the requisitioning EC in the field.

A project plan and procedure for safe transportation, handling, and in-transit storage of hazardous substances will be developed and implemented prior to commencement of construction contracting. This plan will comply with governmental stipulations, regulations, and practices and will be applicable to all project participants. Project violations will be recorded and corrective action noted.

32.11.1.6 Other Movements

Other material movements not mentioned above will be the responsibility of and managed by the CCs. They include items such as cement, explosives, rebar, pipe skids, consumables, and other miscellaneous materials.

32.11.1.7 Personnel Movements

Personnel transportation includes movement from Alaskan points of hire to camps and return, as wall as ongoing rotation and management mobility requirements. Intra-project personnel movements will be required to support a wide variety of activities and organizations with project-related responsibilities. The sources of movement will include contractor organizations, support service activities, management organizations, and government entities. Experience

factors indicate that about six percent of the project camp and station population will move to and from field locations on a daily basis. The reasons for these movements include new hires, terminations, rest and relaxation (R and R), medical personal, and project administration. The extent of these movements will fluctuate with changes in workforce levels throughout all project phases from camp activation to demobilization.

32.11.1.8 Systems

- Air Transport
  Air operations to and within Alaska will be required for a relatively consistent, predictable passenger airlift as well as for priority airfreight operations. Project air movements will require a combination of commercially scheduled and charter aircraft. Dedicated facilities and equipment may be required to minimize public impact and to protect the project schedule.

- Highway Transport
  Virtually all project moves will involve highway operations for final delivery. The timing and nature of a multitude of common carrier or contract trucking requirements will become critical during certain phases of the project. Highway equipment is limited and will be used by all project users and non-project users. In addition to carrier equipment constraints, physical highway limitations and regulatory restraints must also be considered. For all highway deliveries north of Fairbanks (more than half the pipeline ROW) motor carrier operations will be along mostly unpaved highways, which will increase equipment operating costs. These factors will used to be considered in controlling the cost, schedule, and public impacts imposed by the aggregate of project-related highway traffic. The majority of project materials will move through this primary interior gateway for truck delivery to final destinations along the pipeline ROW.
  North of Fairbanks truck transport will be over the unpaved Elliott Highway and Dalton Highway. South of Fairbanks truck transport will be over paved roads along the Richardson Highway to Delta Junction and the Alaska Highway to the Yukon Border. Contingency movements to all sections of the pipeline will be via highway. ANNGTC recognizes the unique character of highway transport in Alaska as a result of restrictive operating conditions, including spring breakup, specialized load handling, and operation over unpaved roads. Close coordination will be maintained with highway regulatory agencies to mitigate the effect of project common carrier and CC movements on public safety and highway maintenance. The PMT will coordinate with motor carriers to minimize the impact of relatively short duration, high volume project demands on limited equipment fleets. Specific steps will be taken to:

  – Monitor line pipe movements and regulate as necessary to ease the traffic density impact on the public road system in accordance with state requirements

  – Coordinate engineered material delivery schedules to prevent overlapping requirements, to level demand for common carrier trucking equipment, and to directly expedite movement of selected items to field users

  - Reduce truck movements by utilizing state-approved pipe trailers specially designed to maximize load factors and operational safety while moving double-jointed pipe
  - Encourage early procurement and delivery to ease impact on vehicle fleet

- Railway Transport

  Rail service in Alaska is available from the ports of Seward, Whittier, and Anchorage to Fairbanks. Although railway line capacity is not considered a constraint in Alaska, total project requirements for rail service must be considered in light of a limited car fleet that also serves other shippers.

  Rail transport within Alaska for project movement will be maximized based on the project schedule and field demands. This local traffic will consist of carload movements from the Port of Seward and container/trailer on flat car movements from the Port of Anchorage. The PMT will provide ongoing coordination with the Alaska Railroad to maximize equipment utilization and minimize total transport costs. Specifically, steps will be taken to:

  - Forecast movement requirements sufficiently in advance for the railroad to ensure equipment and operating personnel availability
  - Develop load configurations that reduce total car fleet requirements
  - Provide mechanically intensive offload capability at Fairbanks to ensure rapid turnaround and consistent car cycles
  - Monitor terminal operations to prevent bottlenecks from developing

- Marine Transport

  Ocean carriers provide the primary transportation link for general cargo between Alaska and the Lower 48. Although the local economy is almost completely dependent upon marine transportation, the Alaskan trade has now matured to the point where service is economical, frequent, and reliable.

  Marine operations pose more tradeoffs in handling efficiency and carrying capacity than any other mode. Potential project movements will use bulk barge fleets, container ships and roll-on/roll-off vessels with increasingly reduced handling requirements.

  The PMT will maintain a current inventory of all marine transport equipment available and will forecast the timing and extent of total marine transport capacity requirements. This will allow projections of potential shortfalls in capacity and consequent delivery delays for all shippers. The PMT will provide liaison with ocean carriers to communicate these projections. Specific steps will be taken to:

  - Supplement existing vessel and supporting equipment fleets sufficiently in advance of anticipated shortfalls
  - Preplan material movements to avoid producing overlapping peaks within the project, with other projects, and with the local economy
  - Monitor port operations to assist in reducing delays in moving project cargo

– Develop operating strategies to ensure rapid cargo throughput and vessel turnaround

32.11.1.9 Intermodal Distribution

Transportation of materials to and within Alaska will require several intermodal transfers. These operations must be effectively incorporated into the project movement system.
The use of direct-delivery containers from the West Coast Transfer Point to the material storage sites will simplify the overall movement program. The containers will reduce port delays often encountered in general cargo-handling operations.
Intermodal containers will be used for transportation of engineered materials to Alaska and distribution in the field. These containers will cycle between the field and the West Coast Transfer Point. Containers will be compatible with all modes and intermediate transfer facilities. The West Coast Transfer Point will consolidate container loads for direct delivery to designated field locations. Movement of containers will be to destination with no requirement for intermediate warehousing.
The container pool can be adjusted up or down from international lease container fleets as required.

32.11.2 Logistics Management

32.11.2.1 Organization

The PMT will develop a core organization to manage its functional logistics responsibilities. Major functions of the Procurement and Logistics PMT group include control of the movement of mainline pipe and other engineered materials through to final delivery to the CCs in the field. In addition, the PMT will coordinate and monitor other transport requirements and logistics programs, carriers, and transfer facility operators to ensure that the project proceeds as planned. The organization will be integrated with the responsibilities of other participants so that the total logistics program can be executed effectively. The organization structure and position requirements for construction logistics will change as the project develops. Three phases will be involved:

- Project planning
- Mobilization and execution
- Demobilization

32.11.2.2 Control

A key element of logistics control is material information from initial issuance of the purchase order through to final field delivery. Manufacturing or enroute delays or inability to locate needed items will directly impact the project construction schedule and cost. The project philosophy includes use of all modes of transportation, distribution, and intermodal transfer. The material control system will account for each step in the process with a high degree of accuracy and reliability.

32.11.3 Materials Management

The purchased material will be transported and turn over the following materials to the CCs to be incorporated into the permanent work:

- Structural materials, such as prefabricated-building components, structural steel piles and fabricated steel for vessel structures and pipe supports
- Engineered equipment packages, such as compressors, heaters and refrigeration plants complete with all accessories
- Engineered equipment, such as pumps and drivers, heat exchangers, vessels, and storage tanks
- Pipe fittings, flanges, valves and assembly materials, including that material for the mainline, compressor stations, and metering stations. These will be furnished as loose materials and as fabricated pieces.
- Electrical material, including wire, switch boxes, cable tray, conduit, fittings, control panels, and assembly materials
- Instrumentation material, including instruments, wire, tubing, valves, fittings, panels, and assembly materials

The CC will be required to receive, store, weather protect, and issue these materials.
Other types of permanent materials will be furnished by the CC. These will typically be:

- Processed sand and gravel
- Cement
- Reinforcing steel and tie-wire
- Anchor bolts and other embeds
- Concrete admixtures
- Welding materials

Also furnished by the CC will be consumables (those materials that do not become a part of the permanent work). Included in these materials are typically:

- POL products
- Bottled gas, such as oxygen, acetylene, argon, and nitrogen
- Concrete form work, lumber, and related hardware
- Scaffolding and temporary shoring
- Weather protection, such as canvas and plastic tarpaulins and visqueen
- Timber for supports, sleepers, and dunnage
- Small tools
- Spare parts

- Explosives

The CC will be responsible to receive and warehouse these materials and all other materials not furnished by ANNGTC.
The CC will have final responsibility for storage and use project materials. To avoid schedule impacts comprehensive material handling procedures will be established to preclude material loss, damage, and waste. Areas of authority and responsibility for both the PMT and CC will be well defined.

32.11.3.1 Tracking and Distribution Control of Material after Purchase and Before Delivery to the Storage Site

Computer programs will be developed that will track all purchased materials from the manufacturer/vendor to receipt by the CC. This program will cover all milestone movements, including any enroute changes of transport and stop-offs for remanufacture (i.e., double-jointing, coating, and fabricating). The PMT will coordinate with each CC the most efficient distribution plan as it applies to its section of the line.

32.11.3.2 Receiving

All furnished materials delivered to the various material storage locations will be consigned directly to the CC or PSC responsible for that storage location.

32.11.3.3 Storing

The PMT will review all existing storage yards and warehousing-facilities for adequate security and proper physical layout (fencing, citing, drainage, etc.). Where shortcomings are detected, corrections will be made by the PMT. prior to storing material. Some yards will include both enclosed warehousing and outside storage areas. In selecting these multi-purpose yards, existing and new sites will be reviewed for accessibility.
The material handling procedures of all CCs will be defined in detail. Any procedures that do not meet acceptable standards will be discussed and resolved with the applicable contractor.
A portion of the total contingency assigned bulk materials will also be stored at this facility. This material will be issued to meet the various CC requirements as requested and approved by ANNGTC.